

WHAT IS CLAIMED IS:

1. A laser irradiation method for irradiating a beam spot to an object to be irradiated, comprising:

shaping a laser beam emitted from a laser oscillator to become the beam spot on a surface to be irradiated; and

scanning the scanning stage relatively in the direction of a minor axis of the beam spot while irradiating the beam spot,

wherein the beam spot has one of a linear shape and an elliptical shape,

wherein a surface of the object to be irradiated provided over a scanning stage is the surface to be irradiated,

wherein the beam spot is irradiated while positions of the object to be irradiated and the beam spot are controlled to shield a portion of the beam spot with a light-shielding film provided over the object to be irradiated, and

wherein the portion of the beam spot has a lower energy density than the center of the beam spot.

2. A laser irradiation method according to claim 1, wherein a distance between a surface of the light-shielding and the surface of the object to be irradiated is not more than 10  $\mu\text{m}$ .

3. A laser irradiation method according to claim 1, wherein a distance between a surface of the light-shielding film and the surface of the object to be irradiated is not more than 1  $\mu\text{m}$ .

4. A laser irradiation method according to claim 1, wherein the light-shielding film comprises a metal film.

5. A laser irradiation method according to claim 1, wherein the light-shielding film comprises an insulating film.

6. A laser irradiation method according to claim 1, wherein the laser oscillator is a continuous wave solid laser.

7. A laser irradiation method according to claim 1, wherein the laser

oscillator is one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser, alexandrite laser, and Ti: Sapphire laser.

8. A laser irradiation method according to claim 1, wherein the laser oscillator is one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous wave CO<sub>2</sub> laser.

9. A laser irradiation method according to claim 1, wherein the laser beam is higher harmonic.

10. A method for manufacturing a semiconductor device, comprising:  
forming a non single-crystal semiconductor film over a substrate;  
providing a light-shielding film with an opening over the non single-crystal semiconductor film;  
shaping a laser beam emitted from a laser oscillator to become a beam spot on a surface to be irradiated; and  
performing laser annealing to the non-single crystal semiconductor film while an irradiated position of the beam spot is relatively moved,  
wherein the beam spot has one of a linear shape and an elliptical shape,  
wherein a surface of the non single-crystal semiconductor film is the surface to be irradiated,  
wherein a portion of the beam spot is shielded with the light-shielding film while the laser annealing to the non-single crystal semiconductor film is performed, and  
wherein the portion of the beam spot has a lower energy density than the center of the beam spot.

11. A method for manufacturing a semiconductor device according to claim 10, wherein a distance between a surface of the light-shielding film and the surface of the semiconductor film is not more than 10  $\mu\text{m}$ .

12. A method for manufacturing a semiconductor device according to claim 10, wherein a distance between a surface of the light-shielding film and the surface of the semiconductor film is not more than 1  $\mu\text{m}$ .

13. A method for manufacturing a semiconductor device according to claim 10, wherein the light-shielding film comprises a metal film.

14. A method for manufacturing a semiconductor device according to claim 10, wherein the light-shielding film comprises an insulating film.

15. A method for manufacturing a semiconductor device, comprising:  
forming a non single-crystal semiconductor film over a substrate;  
forming an anti-contamination film over the non-single crystal semiconductor film;  
providing a light-shielding film with an opening over the anti-contamination film;  
shaping a laser beam emitted from a laser oscillator to become a beam spot on a surface to be irradiated; and  
performing laser annealing to the non-single crystal semiconductor film while an irradiated position of the beam spot is relatively moved,  
wherein the beam spot has one of a linear shape and an elliptical shape,  
wherein a surface of the non single-crystal semiconductor film is the surface to be irradiated,  
wherein a portion of the beam spot is shielded with the light-shielding film while the laser annealing to the non-single crystal semiconductor film is performed, and  
wherein the portion of the beam spot has a lower energy density than the center of the beam spot.

16. A method for manufacturing a semiconductor device according to claim 15, wherein a distance between a surface of the light-shielding film and the surface of the semiconductor film is not more than 10  $\mu\text{m}$ .

17. A method for manufacturing a semiconductor device according to claim 15, wherein a distance between a surface of the light-shielding film and the surface of the semiconductor film is not more than 1  $\mu\text{m}$ .

18. A method for manufacturing a semiconductor device according to claim 15, wherein the light-shielding film comprises a metal film.

19. A method for manufacturing a semiconductor device according to claim 15, wherein the light-shielding film comprises an insulating film.

20. A method for manufacturing a semiconductor device according to claim 15, wherein the anti-contamination film comprises a silicon oxide film.

21. A method for manufacturing a semiconductor device according to claim 10, wherein the laser oscillator is a continuous wave solid laser.

22. A method for manufacturing a semiconductor device according to claim 15, wherein the laser oscillator is a continuous wave solid laser.

23. A method for manufacturing a semiconductor device according to claim 10, wherein the laser oscillator is one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser, alexandrite laser, and Ti: Sapphire laser.

24. A method for manufacturing a semiconductor device according to claim 15, wherein the laser oscillator is one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser, alexandrite laser, and Ti: Sapphire laser.

25. A method for manufacturing a semiconductor device according to claim 10, wherein the laser oscillator is one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous wave CO<sub>2</sub> laser.

26. A method for manufacturing a semiconductor device according to claim 15, wherein the laser oscillator is one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous wave CO<sub>2</sub> laser.

27. A method for manufacturing a semiconductor device according to claim 10, wherein the laser beam is higher harmonic.

28. A method for manufacturing a semiconductor device according to claim 15, wherein the laser beam is higher harmonic.

29. A laser irradiation system comprising;  
a laser oscillator;  
an optical system shaping a laser beam emitted from the laser oscillator to become a beam spot on a surface to be irradiated; and  
a means for shielding a portion of the beam spot with a light-shielding film formed over the surface to be irradiated and adjusting an irradiated position to irradiate the other portion of the beam spot to the surface to be irradiated,  
wherein the beam spot has one of a linear shape and an elliptical shape.

30. A laser irradiation system according to claim 29, wherein the light-shielding film comprises a metal film.

31. A laser irradiation system according to claim 29, wherein the light-shielding film comprises an insulating film.

32. A laser irradiation system according to claim 29, wherein the laser oscillator is a continuous wave solid laser.

33. A laser irradiation system according to claim 29, wherein the laser oscillator is one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser, alexandrite laser, and Ti: Sapphire laser.

34. A laser irradiation system according to claim 29, wherein the laser oscillator is one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous wave CO<sub>2</sub> laser.

35. A laser irradiation system according to claim 29, wherein the laser oscillator emits higher harmonic.

36. A method for manufacturing a semiconductor device, comprising:  
forming a semiconductor film over a substrate;  
providing a light-shielding film with an opening over the non

semiconductor film; and

irradiating a laser beam to the semiconductor film through the opening of the light-shielding film while the substrate is relatively moved.

37. A method for manufacturing a semiconductor device according to claim 36, wherein the laser beam has one of a linear shape and an elliptical shape.

38. A method for manufacturing a semiconductor device according to claim 36, wherein a portion of the laser beam is shielded with the light-shielding film and the portion has a lower energy density than the center of the laser beam.

39. A method for manufacturing a semiconductor device according to claim 36, wherein a distance between a surface of the light-shielding film and a surface of the semiconductor film is not more than 10  $\mu\text{m}$ .

40. A method for manufacturing a semiconductor device according to claim 36, wherein a distance between a surface of the light-shielding film and a surface of the semiconductor film is not more than 1  $\mu\text{m}$ .

41. A method for manufacturing a semiconductor device according to claim 36, wherein the light-shielding film comprises a metal film.

42. A method for manufacturing a semiconductor device according to claim 36, wherein the light-shielding film comprises an insulating film.

43. A method for manufacturing a semiconductor device according to claim 36, wherein the laser beam is emitted from a continuous wave solid laser.

44. A method for manufacturing a semiconductor device according to claim 36, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser, alexandrite laser, and Ti: Sapphire laser.

45. A method for manufacturing a semiconductor device according to claim 36, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous

wave CO<sub>2</sub> laser.

46. A method for manufacturing a semiconductor device according to claim 36, wherein the laser beam is higher harmonic.

47. A method for manufacturing a semiconductor device, comprising:  
forming a semiconductor film over a substrate;  
providing a light-shielding film with an opening over the non semiconductor film; and  
irradiating a laser beam to the semiconductor film through the opening of the light-shielding film, while a distance between a surface of the light-shielding film and a surface of the semiconductor film is not more than 10  $\mu\text{m}$ .

48. A method for manufacturing a semiconductor device according to claim 47, wherein the laser beam has one of a linear shape and an elliptical shape.

49. A method for manufacturing a semiconductor device according to claim 47, wherein a portion of the laser beam is shielded with the light-shielding film and the portion has a lower energy density than the center of the laser beam.

50. A method for manufacturing a semiconductor device according to claim 47, wherein a distance between a surface of the light-shielding film and the surface of the semiconductor film is not more than 1  $\mu\text{m}$ .

51. A method for manufacturing a semiconductor device according to claim 47, wherein the light-shielding film comprises a metal film.

52. A method for manufacturing a semiconductor device according to claim 47, wherein the light-shielding film comprises an insulating film.

53. A method for manufacturing a semiconductor device according to claim 47, wherein the laser beam is emitted from a continuous wave solid laser.

54. A method for manufacturing a semiconductor device according to claim 47, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser,

alexandrite laser, and Ti: Sapphire laser.

55. A method for manufacturing a semiconductor device according to claim 47, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous wave CO<sub>2</sub> laser.

56. A method for manufacturing a semiconductor device according to claim 47, wherein the laser beam is higher harmonic.

57. A method for manufacturing a semiconductor device, comprising:  
forming a semiconductor film over a substrate;  
providing a light-shielding film with an opening over the non semiconductor film; and  
irradiating a laser beam to the semiconductor film through the opening of the light-shielding film while the substrate is relatively moved,  
wherein a portion of the laser beam is shielded with the light-shielding film and the portion has a lower energy density than the center of the laser beam.

58. A method for manufacturing a semiconductor device according to claim 57, wherein the laser beam has one of a linear shape and an elliptical shape.

59. A method for manufacturing a semiconductor device according to claim 57, wherein a distance between a surface of the light-shielding film and a surface of the semiconductor film is not more than 10  $\mu\text{m}$ .

60. A method for manufacturing a semiconductor device according to claim 57, wherein a distance between a surface of the light-shielding film and a surface of the semiconductor film is not more than 1  $\mu\text{m}$ .

61. A method for manufacturing a semiconductor device according to claim 57, wherein the light-shielding film comprises a metal film.

62. A method for manufacturing a semiconductor device according to claim 57, wherein the light-shielding film comprises an insulating film.



63. A method for manufacturing a semiconductor device according to claim 57, wherein the laser beam is emitted from a continuous wave solid laser.

64. A method for manufacturing a semiconductor device according to claim 57, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser, alexandrite laser, and Ti: Sapphire laser.

65. A method for manufacturing a semiconductor device according to claim 57, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous wave CO<sub>2</sub> laser.

66. A method for manufacturing a semiconductor device according to claim 57, wherein the laser beam is higher harmonic.

67. A method for manufacturing a semiconductor device, comprising:  
forming a semiconductor film over a substrate;  
providing a light-shielding film with an opening over the non semiconductor film; and  
irradiating a laser beam to the semiconductor film through the opening of the light-shielding film while a distance between a surface of the light-shielding film and a surface of the semiconductor film is not more than 10  $\mu\text{m}$ ,  
wherein a portion of the laser beam is shielded with the light-shielding film and the portion has a lower energy density than the center of the laser beam.

68. A method for manufacturing a semiconductor device according to claim 67, wherein the laser beam has one of a linear shape and an elliptical shape.

69. A method for manufacturing a semiconductor device according to claim 67, wherein a distance between a surface of the light-shielding film and the surface of the semiconductor film is not more than 1  $\mu\text{m}$ .

70. A method for manufacturing a semiconductor device according to claim 67, wherein the light-shielding film comprises a metal film.

71. A method for manufacturing a semiconductor device according to claim 67, wherein the light-shielding film comprises an insulating film.

72. A method for manufacturing a semiconductor device according to claim 67, wherein the laser beam is emitted from a continuous wave solid laser.

73. A method for manufacturing a semiconductor device according to claim 67, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of YAG laser, YVO<sub>4</sub> laser, YLF laser, YAlO<sub>3</sub> laser, Y<sub>2</sub>O<sub>3</sub> laser, alexandrite laser, and Ti: Sapphire laser.

74. A method for manufacturing a semiconductor device according to claim 67, wherein the laser beam is emitted from one kind or plural kinds selected from the group consisting of continuous wave Ar laser, continuous wave Kr laser, and continuous wave CO<sub>2</sub> laser.

75. A method for manufacturing a semiconductor device according to claim 67, wherein the laser beam is higher harmonic.